

CLAIMS

What is claimed is:

- 1 1. A physical property sensor die, comprising:
2 *SS* a substantially solid insulating sensor body having a front surface and a back surface,
3 *B37* wherein the substrate has a plurality of openings extending from the front surface
4 to the back surface;
5 at least one sensing element coupled to the front surface; and
6 a connection material filling the plurality of openings such that the plurality of sensing
7 elements are electrically connected to corresponding connection material on the
8 back surface, and the connection material is configured to accommodate
9 connection of the connection material to an electronics substrate.
- 1 2. The physical property sensor die of claim 1 wherein the at least one sensing element
2 includes a heater and a thermal sensor.
- 1 3. The physical property sensor die of claim 1 wherein the at least one sensing element
2 includes a temperature sensor.
- 1 4. The physical property sensor die of claim 1 wherein the at least one sensing element
2 includes an environmental sensor.
- 1 5. The physical property sensor die of claim 1 wherein the at least one sensing element
2 include a heater, a first thermal sensor, and a second thermal sensor.
- 1 6. The physical property sensor die of claim 1 wherein the sensor body is made up of a
2 photosensitive glass.
- 1 7. The physical property sensor die of claim 1 wherein the sensor body is made up of a
2 ceramic.
- 1 8. The physical property sensor die of claim 1 wherein the sensor body is made up of a
2 highly melting glass.
- 1 9. The physical property sensor of claim 1 wherein the sensor body is highly insulating
2 silicon.
- 1 10. The physical property sensor die of claim 7 wherein the ceramic is alumina.

- 1 11. The physical property sensor die of claim 8 wherein the ceramic is highly melting glass is
2 fused silica.
- 1 12. The physical property sensor die of claim 6 wherein the photosensitive glass is Foturan.
- 1 13. The physical property sensor die of claim 1 wherein the plurality of sensing elements are
2 constructed of platinum coated on the front surface.
- 1 14. The physical property sensor die of claim 1 wherein the substantially solid sensor body is
2 made up of a first material and a second material, wherein the first material is positioned directly
3 below the plurality of sensing elements.
- 1 15. The physical property sensor die of claim 1 wherein the substantially solid sensor body
2 includes a plug made of a first material positioned below the plurality of sensing elements, the
3 plug being surrounded by a second material which makes up the remainder of the substantially
4 solid sensor body.
- 1 16. The physical property sensor die of claim 15 wherein the plug is substantially cylindrical.
- 1 17. The physical property sensor die of claim 14 wherein the first material is glass and the
2 second material is alumina.
- 1 18. The physical property sensor die of claim 15 wherein the first material is glass and the
2 second material is alumina.
- 1 19. A sensor for measuring physical properties of a fluid adapted to be attached to a sensing
2 circuit, the sensor comprising;
3 a sensor die made up of a substantially solid insulating sensor body and a plurality of
4 sensing elements, wherein the plurality of sensing elements are positioned on a
5 front surface of the substrate and are in communication with a plurality of die vias
6 to allow electrical signals to be transmitted to a back surface of the substrate, the
7 back surface being opposite the front surface and substantially parallel thereto;
8 and
9 a sensor substrate attached to the sensor die in juxtaposition with the back surface, the
10 sensor substrate configured for further attachment to the sensing circuit through a
11 plurality of substrate vias, the substrate vias being in contact with the die vias to
12 allow electrical contact to the sensing circuit.

- 1 20. The sensor of claim 19 further comprising a passivation layer covering the sensing
2 elements.
- 1 21. The sensor of claim 20 wherein the passivation layer is silicon nitride.
- 1 22. The sensor of claim 19 wherein the plurality of sensing elements include a heater and a
2 thermal sensor.
- 1 23. The sensor of claim 19 wherein the plurality of sensing elements include a heater, a first
2 thermal sensor and a second thermal sensor.
- 1 24. The sensor of claim 19 wherein the sensor body is fabricated from a photosensitive glass.
- 1 25. The sensor of claim 20 wherein the sensing elements are platinum structures coated on
2 the first major surface of the sensor body and are covered by the passivation layer.
- 1 26. The sensor of claim 19 wherein the vias include holes in the sensor body extending from
2 the front surface to the back surface.
- 1 27. The sensor of claim 19 further comprising a plurality of interconnect structures
2 positioned on the sensor body and in communication with the die vias to provide appropriate
3 interconnection for the sensing elements.
- 1 28. The sensor of claim 19 wherein the sensor body includes a plug of a first material
2 positioned beneath the sensing elements and a second material making up the remainder of the
3 substrate and surrounding the plug.
- 1 29. The sensor of claim 28 wherein the first material is glass and the second material is
2 alumina.
- 1 30. A method for creating a glass based property sensor, comprising:
2 masking a glass die substrate using a mask having a predetermined masking pattern,
3 wherein the mask is made of a material to selectively block predetermined light
4 signals;
5 irradiating the masked glass die substrate so as to expose the unmasked portions of the
6 glass die substrate;
7 annealing the glass die substrate so as to remove the mask and crystallize those portions
8 of the glass die substrate that were not covered by the mask;
9 etching the crystallized portions of the glass substrate; and

